

Part Marking and Identification Materials for MISSE

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The Materials on *International Space Station* Experiment (MISSE) is being conducted with funding from NASA and the U.S. Department of Defense, in order to evaluate candidate materials and processes for flight hardware. MISSE modules include test specimens used to validate NASA technical standards (e.g., NASA-STD-6002, Rev. A, "Applying Data Matrix Identification Systems on Aerospace Parts") for part markings exposed to harsh environments in low-Earth orbit and space, including:

- Atomic oxygen (causes severe erosion in plastics and some metals)
- Ultraviolet radiation (deteriorates and darkens many plastics and coatings)
- Thermal vacuum cycling (alters physical properties of many materials)
- Meteoroid and orbital debris impact (inflicts mechanical damage on all materials)

Marked test specimens are evaluated and then mounted in a passive experiment container (PEC) that is affixed to an exterior surface on the *International Space Station* (ISS). They are exposed to atomic oxygen (ram face) and/or ultraviolet radiation (wake face) for a year or more before being retrieved and reevaluated. Criteria include percent contrast, axial uniformity, print growth, error correction, and overall grade.

MISSE 1 and 2 (2001–2005), MISSE 3 and 4 (2006–2007), and MISSE 5 (2005–2006) have been completed to date. Acceptable results were found for test specimens marked with Data Matrix™ symbols by Intermec Inc. and Robotic Vision Systems Inc. (now owned by Siemens Energy & Automation), using:

- Laser bonding
- Vacuum arc vapor deposition
- Gas assisted laser etch
- Chemical etch
- Mechanical dot peening
- Laser shot peening
- Laser etching
- Laser induced surface improvement

MISSE 6 (2008–2009) is exposing specimens marked by DataLase®, Chemico Technologies Inc., Intermec Inc., and tesa® with laser-markable paint, nanocode tags, DataLase and tesa laser markings, and anodized metal labels.

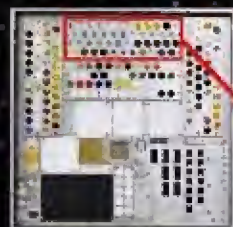
Completed



MISSE-3 (Facing Ram)



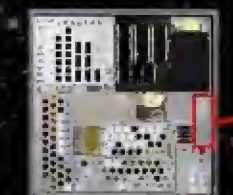
DataMatrix™
Part Markings



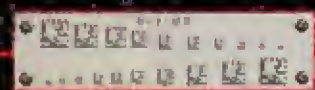
MISSE-4 (Facing Ram)



DataMatrix™
Part Markings



MISSE-4 (Facing Wake)

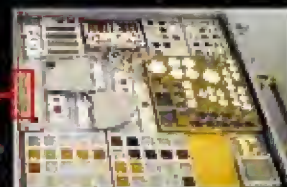


DataMatrix™ Part
Markings (Postflight)

In Progress



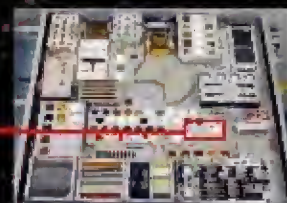
Anodized Tags



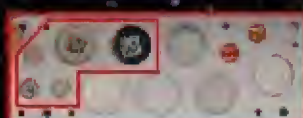
MISSE-6A (Facing Ram)



Nanocode



MISSE-6B (Facing Ram)



DataLase, tesa, Nanocode



MISSE-6B (Facing Wake)